3. THE STRATEGIC APPROACH AND MANAGEMENT STRATEGY TO ACHIEVE THE GOALS OF THE SUMMER CHUM SALMON RECOVERY PLAN

In developing a strategy for the recovery of summer chum salmon, the National Research Council (1992) suggests the ideal would be restoration of Hood Canal and Eastern Strait of Juan de Fuca landscapes and ecosystems, *"to an approximation of its natural predisturbance condition."* However, such a goal is impractical, if not impossible, to achieve. To succeed, a strategy must incorporate an understanding, context, and perspective of both the fishes' needs and human needs. This starting point can insure that recovery efforts are consistent with the goals of abundance, productivity, diversity, and spatial structure, as well as practical in terms of cost and public acceptance.

Despite our knowledge about summer chum, a strategic approach must incorporate the existence of uncertainty. That uncertainty means that our knowledge is provisional and based on assumptions that may change over time. To address that dynamic, the Summer Chum Salmon Recovery Plan (SRP) stresses the monitoring of implemented actions, and adaptive approaches in the planning of new actions.

Finally, the SRP stresses that recovery is a long-term endeavor. Even when numerical targets that allow summer chum delisting are reached, mechanisms must be in place that will maintain the species over time. The SRP strives to suggest those mechanisms.

3.1. Recovery or Extinction

Summer chum salmon produced in the Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU are in overall long-term decline. Taking no action insures that the population's decline will continue, and that eventual extinction likely will occur. Continuing current habitat restoration and protection projects without coordination will provide some improvement. However, this approach runs the risk that some critical ecological bottlenecks will be overlooked and remain unaddressed. The most likely result of that policy will be to continue in the "threatened with extinction" stage on the way to ultimate extinction.

A coordinated plan that addresses all aspects of recovery can provide the mechanism to bring together all the efforts that address summer chum salmon in the Hood Canal and eastern Strait of Juan de Fuca watersheds. A coordinated approach can focus the various projects and site-specific recovery actions. And, with monitoring and adaptive management, recovery actions can be adjusted as more information is gained.

An additional benefit of coordination and planning is that it can facilitate recovery at the necessary scale of an ESU. That means that not all geographic areas or fish populations are equal in their importance or their ability or opportunity for recovery. To address these differential properties, the SRP provides a range of options and alternatives for goal achievement with the overall focus on the recovery of the ESU as a whole.

3.2. Guiding Principles

Recovery actions developed and recommended in this SRP are based on their probable consequences for summer chum salmon, their habitats, and associated ecosystems. Even as we understand more about these ecosystems and habitats, it is important to appreciate that our knowledge will always be incomplete. And, that uncertainty can always be used as an excuse for inaction or delay. However, uncertainty can be addressed systematically and with the idea that we should act with the information we have now and seek the information that will give us an ability to modify our past actions to be more precise in the future. That systematic method has been referred to as the precautionary principle.

The precautionary principle involves acting to avoid serious or irreversible harm, despite a lack of scientific certainty as to the likelihood, magnitude or causation of that harm (Cooney 2003). It was developed through environmental risk management to address public health and pollution problems (Kriebel, et al 2001). At the international level, the precautionary principle has been applied in many arenas. It is an adopted principle in the European Union (Commission 2000). The 1992 Rio Conference on the Environment and Development adopted at the Rio Declaration in principle 15. That principle states, “in order to protect the environment, the precautionary principle approach shall be widely applied by States according to their capability. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” Other institutions that apply the precautionary principle to their activities include the World Trade Organization (WTO) and the United Nations Convention on Biodiversity.

The precautionary principle provides tests for making decisions with uncertainty (Commission 2000). Those tests are:

- Proportionality – which means that any measures contemplated to address an issue should not be disproportionate to the desired level of protection. And that level of protection should not aim at zero risk. However, those measures must also address long-term threats and issues that have possible irreversible outcomes.

- Non-discrimination – which means that comparable situations must not be treated differently.

- Consistency – which means that measures should be congruous with those that have already been adopted in similar circumstances or those that use similar approaches.

- Examination of the benefits and costs of action or lack of action – which means that the actions contemplated, must produce an overall advantage in terms of reducing risk to an acceptable level. This is not just an economic cost-benefit analysis; it is wider in scope and should include non-economic considerations. It also requires an analysis of the efficacy of actions and their acceptability to the public.

- Examination of scientific developments – which means that measures taken to address an issue should be maintained as long as the scientific data are inadequate, imprecise or inconclusive. And that scientific research should be undertaken to obtain more advanced or complete assessments in order to reevaluate the necessity of maintaining those measures.

In addition to the precautionary principle, this SRP also attempts to apply specific guiding principles from conservation biology. Those principles suggest it is important to:

- Maintain stable or increasing trends in abundance of summer chum salmon throughout the ESU.
- Restore and maintain suitable habitat conditions for all summer chum salmon life stages and life histories and maintain functional corridors linking these habitats.
- Conserve genetic diversity and provide opportunity for genetic exchange.
- Protect and maintain existing quality habitats that function as refugia from which salmonid populations may expand.
- Emphasize self-sustaining, abundant, diverse, and widely distributed runs of naturally produced summer chum salmon when developing protection and restoration strategies.
- Identify, protect, and restore those areas that exhibit high existing summer chum salmon use, which have the greatest production potential or a high future conservation value for summer chum salmon.
- Maintain and restore watershed processes that create habitat characteristics favorable to summer chum salmon.
- Maintain connectivity between high quality habitats to allow for recolonization and population expansion as degraded systems recover.

3.3. The Recovery Management Strategy-prioritization of recovery actions

The strategy for recovery actions (projects or programmatic) is patterned after the framework as proposed by the Puget Sound Technical Recovery Team that is based upon work of the National Research Council (NRC 1992, 1996) and the aquatic diversity management concept of Moyle and Yoshiyama (1994). The PSTRT 2003 describes four strategy types; 1) protect, 2) restore, 3) rehabilitate, and 4) substitute. A fifth strategy type is also noted as status quo. It is also based on specific information from the limiting factors analyses for WRIAs 14/15, 16, 17, and 18; refugia studies for Jefferson and Kitsap Counties; the Summer Chum Salmon Conservation Initiative (WDFW and PNPTT 2000); the HCCC Lead Entity Salmon Habitat Restoration Strategy (HCCC 2004); as well as other relevant studies and assessments. The SRP also uses the summer chum salmon Ecosystem Diagnostic and Treatment (EDT) Model (see Appendices A and B).

3.3.1. Protect

The intent of the *protect* concept is the preservation of areas that are ecologically intact and healthy so that naturally regenerative processes can continue. This approach preserves the “natural capital” investment and allows for future recovery opportunities. Actions to implement that *protect* would be designed to prevent adverse impacts by protecting watersheds and areas with currently functioning natural processes. Such actions can allow for rebuilding or recolonization by summer chum salmon. The likelihood that this overall recovery strategy will succeed is enhanced due to this protection.

Table 3.1 adapted from the Puget Sound TRT Watershed Guidance document (PSTRT 2003) gives examples of the general habitat management strategies to protect habitat forming processes or specific aquatic habitat characteristics.

Table 3.1. Examples of the general habitat management strategies to protect habitat forming processes or specific aquatic habitat characteristics

Aquatic Habitat Characteristic	**Linked Physical Environmental Characteristics and Processes**	**<u>Protect</u> habitat strategy for development of recovery actions**
Channel Scour	Geomorphology Hydrology Sediment Transport	Maintain natural processes in watershed through education, conservation easements, or acquisition.
Water Temperature	Hydrology Succession	Maintain natural processes in watershed through education, conservation easements, or acquisition.
Fine Sediments	Geomorphology Hydrology Sediment Transport	Maintain natural processes in watershed through education, conservation easements, or acquisition.
Estuarine Acreage	Geomorphology Hydrology Sediment Transport	Maintain natural processes in watershed through education, conservation easements, or acquisition.

3.3.2. Restore

Where it is determined that recovery of natural processes is feasible a strategy of *restore* will be employed. The *restore* strategy, or restoration, is the "reestablishment of predisturbance aquatic functions and related physical, chemical, and biological characteristics" (NRC 1992). Restoration can occur with either an active or passive approach. The passive approach would remove the anthropogenic controls and allow the natural processes such as floods, natural revegetation, and erosion to restore the structures and functioning conditions. Active restoration removes the anthropogenic controls and supplements natural processes with artificial actions that are intended to accelerate the return to functioning conditions. Table 3.2, adapted from the Puget Sound TRT Watershed Guidance document (PSTRT 2003), gives examples of the general habitat management strategies to restore habitat forming processes or specific aquatic habitat characteristics.

Table 3.2. Examples of the general habitat management strategies to restore habitat forming processes or specific aquatic habitat characteristics.

Aquatic Habitat Characteristic	**Linked Physical Environmental Characteristics and Processes**	**Restore habitat strategy for development of recovery actions**
Channel Scour	Geomorphology Hydrology Sediment Transport	Remove dikes. Allow natural cycle of succession to occur throughout the watershed.
Water Temperature	Hydrology Succession	Allow natural cycle of succession to occur in all riparian areas of the watershed.
Fine Sediments	Geomorphology Hydrology Sediment Transport	Close roads in areas with steep slopes. Allow natural cycle of succession to occur throughout the watershed.
Estuarine Acreage	Geomorphology Hydrology Sediment Transport	Remove dikes.

3.3.3. Rehabilitate

The *rehabilitate* strategy is used when ecosystem processes or functions can be partially re-established. Continued anthropogenic intervention is required under a rehabilitation scheme because full restoration of the underlying ecosystem functions cannot occur. Basically the strategy is to rehabilitate watersheds where restoration is not feasible, but actions can be taken to improve aquatic habitats (PSTRT 2003). Rehabilitation acknowledges irreversible changes on the landscape such as urbanization, floodplain losses, and estuarine losses. Table 3.3, adapted from the Puget Sound TRT Watershed Guidance document (PSTRT 2003), gives examples of the general habitat management strategies to rehabilitate habitat forming processes or specific aquatic habitat characteristics.

Table 3.3. Examples of the general habitat management strategies to rehabilitate habitat forming processes or specific aquatic habitat characteristics.

Aquatic Habitat Characteristic	**Linked Physical Environmental Characteristics and Processes**	**Rehabilitate habitat strategy for development of recovery actions**
Channel Scour	Geomorphology Hydrology Sediment Transport	Move dikes back from channel. Institute land-use regulations that reduce the future expansion of impervious area within the watershed.
Water Temperature	Hydrology Succession	Revegetate riparian areas as needed to maintain water temperature. Institute instream flow regulations to maintain appropriate water temperature.
Fine Sediments	Geomorphology Hydrology Sediment Transport	Institute improved road maintenance procedures. Revegetate riparian areas as needed to minimize sediment inputs.
Estuarine Acreage	Geomorphology Hydrology Sediment Transport	Remove dikes blocking access to habitat likely to be usable. Institute land-use regulations prohibiting adverse modification of estuarine areas.

3.3.4. Substitute

Where rehabilitation is not possible on the landscape, the strategy of *substitute* will be used. Substitution is the creation of habitat features lost through degradation and can range from the creation of a spawning channel, adding logs to pools and building stormwater retention/detention systems. Substitution is the deliberate attempt to increase the abundance of selected habitat characteristics as desired. The modifications may be outside of the range of conditions that would occur naturally, but are found to be desirable and necessary in order to restore function. This strategy involves technological interventions that substitute artificial for natural habitat elements and characteristics (NRC 1996). The *substitute* strategy can involve either enhancement or mitigation. Enhancement might shift ecosystems to another state in which neither restoration nor rehabilitation can be achieved. Mitigation involves the extensive use of technological intervention and attempts to offset habitat loss in one area by replacement in another area. Table 3.4, adapted from the Puget Sound TRT Watershed Guidance document (PSTRT 2003), gives examples of the general habitat management strategies to substitute habitat forming processes or specific aquatic habitat characteristics.

Table 3.4. Examples of the general habitat management strategies to substitute habitat forming processes or specific aquatic habitat characteristics.

Aquatic Habitat Characteristic	**Linked Physical Environmental Characteristics and Processes**	**Substitute habitat strategy for development of recovery actions**
Channel Scour	Geomorphology Hydrology Sediment Transport	Install stormwater retention system. Construct off-site spawning channel.
Water Temperature	Hydrology Succession	Store and provide water as necessary to maintain appropriate water temperature.
Fine Sediments	Geomorphology Hydrology Sediment Transport	Install sediment traps. Construct off-site spawning channel.
Estuarine Acreage	Geomorphology Hydrology Sediment Transport	Create new estuarine habitat.

3.3.5. Status Quo

A final strategy category is designated as *status quo*. The *status quo* strategy is considered when existing or continuing loss of habitat and ecological functions due to human activities is accepted and will likely result in continued habitat degradation. The strategic approach in this case is to continue the present practices (i.e., land use patterns, habitat modifications, developments) and accept the continued loss of habitat and ecosystem function. Properly functioning conditions cannot be achieved everywhere throughout the ESU nor are they always necessary to recover summer chum salmon. Political feasibility and willingness, economic and technical limitations will determine the degree and extent to which habitat is classified in the status quo category. The level of degradation will determine if any of the other recovery management strategies are possible or if the degradation of the habitat is at a level and intensity beyond recovery.

3.4. Management Strategy Framework

It is anticipated that these five habitat management strategies will work in concert to provide for recovery of summer chum salmon in the Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU. There are complex interactions between the habitat forming processes and the summer chum salmon populations that are targeted for recovery. Due to this complexity there is a decreased certainty of maintaining desired habitat conditions and achieving viable recovered populations as the habitat management strategies move from protect to status quo. Table 3.5 adopted from the TRT's watershed guidance documents (PSTRT 2003) graphically depicts this range (protect to substitute) of certainty.

Table 3.5. Framework for Development of the Summer Chum Salmon Recovery Plan Strategy as modified from PSTRT (2003)

Evaluation Criteria	Strategy Type
Increasing Uncertainty of Success in Achieving VSP Parameters Increasing Ongoing Resource Inputs to Achieve Viability Increasing Evaluation and Monitoring Required	**Protect**: Protect watersheds where the VSP parameters of the population are supported by fully functioning natural processes. Significant uncertainty exists in our ability to predict the effectiveness and temporal pattern of restoration, rehabilitation, and substitution actions. By protecting watersheds with functioning natural processes, we provide refuges for recolonization and maximize the likelihood that our strategy will contribute to achieving the VSP parameters of the population.
	Restore: Restore watersheds where habitat degradation has occurred but recovery of natural processes is feasible. Restoration is the "reestablishment of predisturbance aquatic functions and related physical, chemical, and biological characteristics" (NRC, 1992). Restoration can occur through either a passive or active approach: Passive. Anthropogenic controls are removed and natural processes, such as floods, natural revegetation, or erosion are allowed to restore the watershed to the predisturbance conditions. Active. Anthropogenic controls are removed and natural processes are supplemented by actions intended to accelerate the return to predisturbance conditions.
	Rehabilitate: Rehabilitate watersheds where restoration is not feasible, but actions can be taken to improve aquatic habitat and improve the VSP parameters of the population. Rehabilitation occurs when ecosystem processes or functions are partially re-established. Continual anthropogenic intervention will likely be required because restoration of the underlying ecosystem processes has not occurred.
	Substitute: Substitute habitat features in watersheds where rehabilitation is not possible. Substitution is the creation of habitat features lost through anthropogenic degradation. Substitution can range from the creation of a spawning channel to adding logs to create a pool.

In all cases the strategic priority of this summer chum salmon recovery plan will be to protect. It is recognized that habitats in the Hood Canal/Eastern Strait of Juan de Fuca are at various states of degradation and the ability to provide recovery for the targeted populations will require a mixture of habitat management strategies.

The prioritized order for the summer chum salmon recovery plan management strategies is:

1) Protect
2) Restore
3) Rehabilitate
4) Substitute
5) Status Quo

Each strategy type will be applied to projects and site-specific actions throughout the ESU. The intent of projects and actions will be to support the survival and persistence of the populations or stocks of concern.

3.5. Recovery Action Prioritization of Geographic Areas Within the ESU

To emphasize and promote the need to first recover currently known summer chum salmon populations to a viable status, and then to address other actions that would further benefit ESU viability, the SRP will prioritize recovery actions as follows:

1) The first priority level of recovery would focus on the eight extant populations' watersheds and associated marine areas (nearshore areas within one mile radius of the watershed's estuary).

2) The second priority level of recovery adds the eight extinct populations' watersheds and associated marine areas (nearshore areas within one mile radius of the watershed's estuary).

3) The third priority level of recovery provides for a focus on other watersheds in the ESU with recently documented observed summer chum salmon presence and associated marine areas (nearshore areas within one mile radius of these watersheds' estuaries).

4) The fourth priority level of recovery adds all remaining marine nearshore areas not previously addressed in priority levels 1, 2, and 3.

The specific watersheds and populations receiving this prioritization are described in each individual conservation unit section (section 7-12) of this SRP. Which geographic areas and populations that benefit from recovery actions based on this prioritization scheme will depend on available resources, political willingness, feasibility, and opportunity. Ideally all areas and populations should benefit from recovery actions and the SRP will strive to ensure that, ultimately, all four priority area levels are addressed. A core tenet of the management strategy for this SRP is the preservation of the "natural capital," or those populations and genetic material that still exist. Preserving the extant populations and associated supporting habitats will reverse the current downward trend towards extinction. It

will allow for the opportunity for physical, biological, and genetic material to be available. And it will preserve future opportunities for recovery as the mechanisms of implementation are developed.

Conservation and protection of populations and habitat within the ESU is a necessary first step to provide for the future recovery of summer chum salmon populations. Within the ESU these areas are examined to determine the relevance and appropriateness for implementation of management actions. Restoration is examined where habitat degradation has occurred and where recovery of natural processes appears to be feasible. Selected areas are delineated for specific management actions and project implementation. The assumption is that within any area, both fish distribution and habitat use will not be evenly distributed. And, habitat conditions (as indicated by fish habitat parameters such as pools and large woody debris) or watershed indicators (such as total impervious area, forest cover, wetland loss, and status of benthic invertebrates) may be unconstrained (functioning) or constrained (impaired or degraded). The combination of these two described situations, within each designated area, will provide indications of population productivity risks and opportunities.

Major production areas of the eight extant populations of summer chum salmon will be identified and described according to existing information and data. The SCSCI, refugia studies, and limiting factor analyses provide these initial delineations. Each area will analized according to its unique characteristics and associated recovery strategies. Table 3.6 provides the categories and a description of the general strategic approach for recovery of these areas and their associated summer chum salmon populations:

Table 3.6. General strategic approach for the recovery of summer chum salmon population production areas within each conservation unit.

Priority	Category	Production Area Actions
1	Unconstrained with current summer chum salmon production	Recovery actions and strategies will focus upon protection and passive restoration of watershed processes.
2	Constrained with current summer chum salmon production	Recovery actions and strategies will focus upon restoration, rehabilitation, and substitution approaches, likely artificial, to achieve the watershed processes.
3	Constrained, but with no current summer chum salmon production, but likely had historic production	Pending the reasons for the current lack of summer chum salmon production and change from historic, recovery actions could be limited. Recovery actions and strategies will focus upon restoration, rehabilitation, and substitution approaches. Such actions may require artificial supplementation programs coupled with restorative habitat measures. Recovery actions and strategies for these areas will be determined on a case-by-case basis.
4	Unconstrained, neither current nor historic summer chum salmon production. Determined to contribute to structure and function crucial to persistence and survival of the population of concern	Recovery actions and strategies will focus upon protection and passive restoration of watershed processes.
5	Constrained, neither current nor historic summer chum salmon production. With appropriate restoration and protection measures can contribute to function and structure to enhance persistence and survival of the population of concern	Recovery actions and strategies will focus upon restoration, rehabilitation, and substitution approaches. Such actions may require artificial supplementation programs coupled with restorative habitat measures. Recovery actions and strategies for these areas will be determined on a case-by-case basis.
6	Constrained, neither current nor historic summer chum salmon production. Determined does not and cannot contribute to structure and function critical for the persistence and survival of the population of concern	Status quo is likely maintained.

Protection and restoration of the major production areas is a necessary first step to provide for the future recovery of salmonid populations in Hood Canal. Conservation functions associated with specific geographic areas comprise the range necessary for reproduction, growth, and maturation. The Hood Canal Summer Chum Salmon Recovery Plan examines these areas to determine the relevance and appropriateness for implementation of management actions.

Based on the criteria described above, and the theoretical conservation function attributes, six *conservation units* have been designated for the Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU. SRP sections 7-12 provide details for each conservation unit including the individual populations that are needed to be viable for ESU-wide recovery to be accomplished.

3.6. Conservation Units

The Summer Chum Salmon Recovery Plan designates conservation units that, in total, comprise the ESU. For the purposes of this SRP a conservation unit is a geographic grouping of the summer chum salmon populations that have been identified and targeted for recovery by the co-managers and the TRT. Populations that have initially been targeted for recovery are those described by the co-managers (PNPTT and WDFW 2003). Table 3.7 presents the six designated conservation units and their eight associated populations. Also presented are the eight extinct populations. Specific details for each conservation unit are presented in sections 7-12 of this SRP.

Table 3.7. Summer chum salmon populations associated with the designated conservation units.

CONSERVATION UNIT		POPULATIONS[17]	STATUS[18]
1	Lilliwaup-Skokomish	Lilliwaup	Extant-Supplemented
		Finch	Extinct
		Skokomish	Extinct
2	Hama Hama-Duckabush-Dosewallips	Hama Hama	Extant-Supplemented
		Duckabush	Extant
		Dosewallips	Extant
3	Eastern SJF	Dungeness	Extant?-Extinct?
		Jimmycomelately	Extant-Supplemented
		Snow/Salmon	Extant-(Supplemented in Salmon Creek only)
		Chimacum	Extinct-Reintroduced
4	Quilcene	Big/Little Quilcene	Extant-Supplemented
5	West Kitsap	Dewatto	Extinct
		Anderson	Extinct
		Big Beef	Extinct-Reintroduced
6	Union	Union	Extant-Supplemented
		Tahuya	Extinct-Reintroduced

The six conservation units for the Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU are depicted in Figure 3.2.

[17] Shaded populations have identified interim recovery goals as developed by the co-managers (PNPTT and WDFW 2003). Each of these populations need to achieve a low-risk status. Extinct populations are described in WDFW and PNPTT 2000, and later in the respective conservation unit sections of this SRP.
[18] Supplementation and reintroduction programs are summarized below in Chapter 5 and described in detail in WDFW and PNPTT 2000 and subsequent supplemental reports.

Figure 3.2. Map showing the six conservation units designated for recovery planning within the summer chum salmon ESU. Rivers of natural origin populations, both extant and extinct, are noted in darker blue (map produced by Gretchen Peterson, PetersonGIS).

For each conservation unit, the SRP in section 7-12 describes:

- **Geographic boundaries and inclusive watersheds and marine nearshore areas.**

Each conservation unit section (sections 7-12) presents maps along with summary narrative descriptions for each conservation unit.

- **Status of the summer chum populations associated with each conservation unit**

Summer chum salmon populations have been identified and described in the Summer Chum Salmon Conservation Initiative (SCSCI 2000 and SCSCI 2003b). Each conservation unit chapter in this SRP provides a summary of these conclusions including interim recovery goals for these populations as developed by the co-managers.

- **Habitat overview and environmental conditions**

Each conservation unit chapter provides a description of the identified factors within the unit that contribute to the decline of the unit's associated population as well as the current land use development patterns.

- **Specific action recommendations**

Each conservation unit chapter describes specific actions (projects and programmatic) as appropriately designed to achieve the conservation functions needed for that particular conservation unit. These specific actions, within each unit, work in concert with actions developed for the other conservation units, to achieve overall ESU-wide recovery. Specific actions are based on an analysis of projects required to restore and enhance habitats within the conservation unit. Programmatic actions are derived from analyses and assessments developed by County staffs that 1) describe current land use and regulatory programs that are related to and impact summer chum salmon habitat, 2) determine projected build-out and development within the conservation units given those current land use and regulatory programs, 3) identify potential conflicts, both now and at build-out, with summer chum salmon habitat and 4) describe action alternatives and programmatic options that address the conflicts, as appropriate and feasible. Similar in rationale and logic to the designation of the Puget Sound chinook salmon geographic regions by the Puget Sound TRT (PSTRT 2001 and PSTRT 2002), the conservation units are regions that have correlated likelihood of catastrophic risks and similar ecological and political characteristics. Further characteristics of a conservation unit include:

- Similarities of geography/geomorphology, hydrogeography, biogeography and geology,
- The groupings of the summer chum salmon populations have likely evolved in common,
- Identified populations associated with each conservation unit seem to have similarities in response to environmental conditions, harvest regimes, and hatchery influence,
- Environments unique to each conservation unit affect life history strategies and the habitats that support and express those life histories of the summer chum salmon populations associated with the conservation unit,
- The factors that are suspected to contribute to the decline of the populations within the conservation unit are similar,
- Summer chum salmon populations and their supporting habitats associated within a conservation unit are subject to similar patterns of impacts and effects from:
    - Developmental and land-use characteristics,
    - Human growth development and pressures,
    - Land-use authorities and their approaches towards management and regulation of land use and growth, and
    - Political and biological opportunities to affect recovery within the conservation unit are similar.

Conservation units, for the purposes of this SRP, are envisioned as a means to provide organization of analyses and approaches for recovery of the targeted populations. The conservation units assist in focusing recovery efforts and prioritizing actions. These designations also allow community and volunteer groups, and citizens that are already organized in the ESU, to direct their efforts at specific recovery issues. Local land use authorities can then clearly see how their individual salmon recovery efforts fit in the comprehensive salmon recovery effort throughout the ESU.

Recovery of Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU will be driven not only by the unique biology of the summer chum salmon, but also aspects of political feasibility, opportunity, ability, and willingness. The conservation unit construct provides an approach for salmon recovery that is responsive to the biological needs of the fish in the context of political, economic and social realities.

3.7. The Conservation Unit Construct and ESU-wide Recovery

A critical aspect of conservation units are their conservation function, or how they contribute to the survival and persistence of their associated summer chum populations. A conservation unit's conservation function derives its basis in metapopulation theory. Metapopulations are systems of local populations that are connected and supported by dispersing individuals (strays) between "core" and "satellite" groups (Hanski and Gilpin 1991). Habitat formation and disturbance regimes, on a watershed scale, are naturally and predictably variable, and result in a patchy distribution of habitat types and quality that are spatially and temporally dynamic. It is against this spatially and temporally dynamic template of habitat types and quality that native salmonid populations have adapted. Thus, naturally reproducing salmonid populations are not static in this dynamic environment (Hanski and Gilpin 1991). Local salmonid populations may become extirpated in some habitat patches, while other patches are occupied. And, unoccupied patches may be colonized by dispersal from adjacent populations (Martin 1999). There is a greater chance of recolonization of adjacent reaches if dispersing individuals are healthy and if the patches are well connected. This interaction of populations, which leads to the reestablishment of local populations, is the basis for metapopulation theory.

Within each conservation unit there are core areas or those areas that provide critical life history-habitat associations. These core areas are the production areas for each of the eight extant summer chum salmon populations. The critical life history-habitat associations support life-stage dependent survival, encompass assumed salmonid stock independence, and support those populations, which have been determined to be integral to the recovery of the ESU. Conservation units and associated population production areas are geographically specific and are the building blocks for summer chum salmon recovery planning. Conservation units are inextricably linked within the entire the Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU. Fish spawning and rearing in one part of the ESU are necessarily dependent on other conservation units and core production areas for life history requirements of migration, feeding, protection, and physiological transitions.

Within each conservation unit, the habitats: 1) must be composed of patches that are well-connected, 2) have the structural complexity required for the life-history phases for which it is needed, 3) be large enough to support a viable population, and 4) contain persistent elements of the riverine and marine networks. In other words, the system of habitats that support sustainable life history patterns forms the core habitat (Martin 1999). Core areas can provide future opportunities on which to build the foundation for recovery. Core or production areas within the conservation units are instrumental during the initial phases of conservation and recovery implementation.

Many streams and marine nearshore areas within the Hood Canal/Eastern Strait of Juan de Fuca summer chum salmon ESU conservation units, though not providing productive capacity for populations as do the production areas, do provide refuge and act as buffers in support of population productivity. These areas, sometimes called satellite areas, are also recognized as critical for overall population abundance, productivity, diversity, and distribution, and will be evaluated as part of the conservation function for each conservation unit and overall contribution to the ESU. Within the conservation units, there will also be habitats that occasionally fail to support a particular life phase. These areas become part of a population's habitat area and contribute to the population's abundance. This metapopulation structure is a critical component of habitat restoration and the summer chum salmon recovery strategy, because it requires suitable habitat patches be protected, maintained, restored, and connected to support populations in these satellite areas and straying individuals that may populate those areas. The production potential from satellite or straying individuals supports overall population abundance. However, if the progeny of straying individuals do not survive in currently marginal habitats, this production will not support population recovery. Patches in both the production areas, that are well connected and comprise a conservation unit, must also be well connected amongst each of the six conservation units identified for the summer chum salmon ESU.

3.8. Land Use and Development Potential Within the ESU

The summer chum salmon ESU encompasses four counties and three Indian Tribes with land use and regulatory jurisdiction. The designated conservation units cross these jurisdictional boundaries and cover multiple jurisdictions within a conservation unit (see Figure 3.2 above). The challenge for the SRP is to provide for a management strategy of recovery that is responsive to the biological and physical needs of the summer chum salmon while recognizing the multitude of political jurisdictions that are ultimately responsible for recovery. The SRP:

- will focus on specific solutions or packages of solutions to specific problems in each local area (i.e., conservation unit) and

- will not focus on broad-gauge, generic 'solutions' that have the potential to overreach in terms of proposing new regulations or requiring radical changes that have little chance of being effectively implemented.

While broader approaches cannot be completely ruled out, such approaches must be the only solution left that can address a problem, after localized, specific actions have been exhausted.

The SRP recognizes that land use and potential future development, must be addressed relative to summer chum salmon recovery. This must be done in coordination with the biological needs and physical conditions necessary for survival and persistence of the fish populations. Regulatory and land use programs designed and implemented by the land use authorities (primarily the Counties) must be coordinated with habitat restoration activities, harvest management and supplementation programs. Development of this SRP includes work with County staffs and Boards of County Commissioners within the ESU to:

- Describe current land use regulatory programs relative to summer chum salmon habitat,
- Describe build-out under current regulatory regimes and programs, and
- Identify specific areas and/or regulations that can be considered to address conflicts with summer chum habitat under both current and build-out conditions.

Most of the existing human population and projected development under current regulatory programs occurs in concentrated areas of the ESU outside of the watersheds where the major summer chum populations of concern originate. However, these factors are considered a threat to reintroductions of summer chum salmon into their historic habitats (i.e., west Kitsap County). Figure 3.3 shows the current human population density within the ESU.

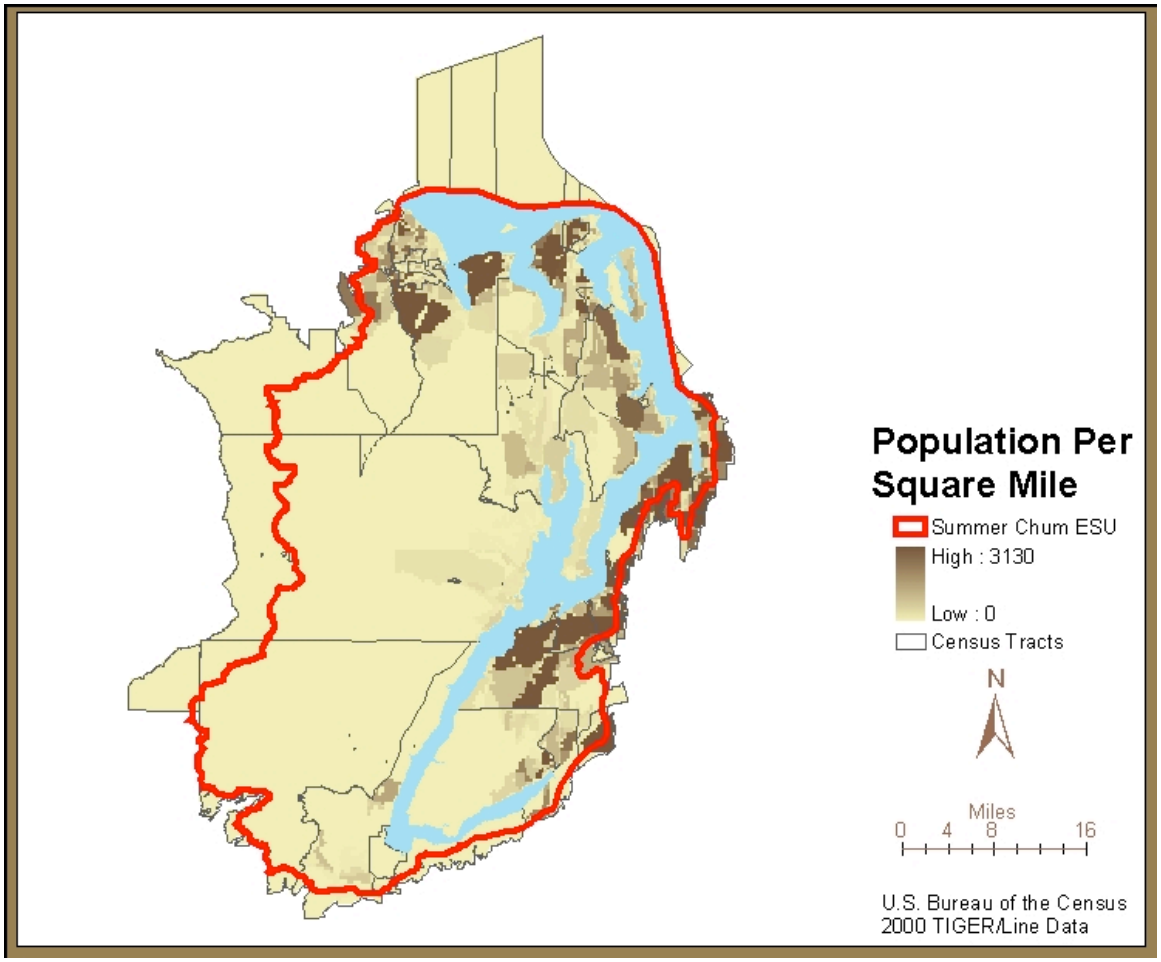

Figure 3.3. Human population per square mile within the summer chum salmon ESU. Map developed by Gretchen Peterson, PetersonGIS 2004.

Development patterns are projected to concentrate development adjacent to existing population concentrations.[19]

3.9. Development of the Policy Options and Management Strategy for Land-use and Regulatory Programs

A full range of policy options for acquiring, funneling and allocating resources for salmon habitat conservation was developed and presented to the members of the HCCC Board for review. That range of options was developed without advocating any particular set of choices. In offering this range of options, there are many that are not acceptable for a variety of reasons. However, that determination is for elected officials to make in combination with the other possible choices that are available to recover summer chum salmon.

[19] See Appendix C for County build-out scenarios and modeling methods.

Listed below is the "universe" of policy approaches that are available. Site-specific recommendations for recovery actions, drawn from the list below, as appropriate, will be presented in each conservation unit section (sections 7-12) to address that area's specific problems:

3.9.1. Potential Sources of Resources – this category describes various sources of funding that could be applied to salmon recovery problems or the underlying environmental conditions on which salmon depend.

3.9.1.1. Grants from Federal Agencies – there a variety of federal sources from which salmon recovery funding is available (US Fish & Wildlife Service, NMFS, NRCS, etc.)

3.9.1.2. Grants from State Agencies – Ecology, the Department of Fish and Wildlife, Puget Sound Water Quality Action Team, and others provide state funding for salmon recovery related projects.

3.9.1.3. General Fund Tax Revenue (local) – County tax revenue has been applied directly, in terms of County mitigation projects, and indirectly, in terms of matching funds for other funding sources to undertake salmon restoration projects.

3.9.1.4. Specific Tax Revenues – provisions in state law allow for locally approved taxing districts to be created to address local problems (local improvement districts, shellfish protection districts, etc.) Also, special purpose governments exist and can be created to address environmental concerns, such as a Public Utility District.

3.9.1.5. Fees – can be charged for use or services, such as day use fees at parks or boat or trailer pumpout charges. Those revenues can be applied to environmental improvement projects.

3.9.1.6. Special Charges - can be levied for degradation or pollution in permitted activity situations such as discharges from sewer plants, etc. Those revenues can be used for environmental remediation.

3.9.1.7. Fines - from regulatory enforcement have been imposed on law violators and can be used to address the causes of environmental degradation.

3.9.1.8. Creation of Markets - with environmental credits, tradable emissions permits and transferable development rights are examples of creating new "commodities" and systems in which those credits can be used to concentrate bad environmental effects in areas that have a greater potential to absorb them.

3.9.1.9. Voluntary Contributions - from memberships and contributions to national groups that undertake or sponsor local action, or contributions directly to local efforts, can aid environmental protection and restoration efforts.

3.9.2. Conduits for Resources – this category describes the administrative path that the resources described above can take to address salmon recovery problems.

3.9.2.1. Federal Government – can target appropriations or earmarks by Congress directly, or through federal agencies.
3.9.2.2. State Government – can target appropriations or earmarks by the Legislature directly, or through state agencies; or it can pass-thru spending from the federal government.
3.9.2.3. County Government – can direct spending, by county commissioners, either through county departments or outside them, using other entities.
3.9.2.4. Tribal Government – can direct spending, by Tribal Councils, through Tribal departments, or outside of them using other entities.
3.9.2.5. Special Purpose Districts – can direct spending through their own programs, or outside of them, using other entities.
3.9.2.6. Non-governmental Organizations (NGOs) – can direct spending through their own programs, or use outside entities.

3.9.3. Targets for Resources – this category describes the activities that could be undertaken with the resources described above, to address salmon recovery problems.

3.9.3.1. Voluntary Means – this category includes optional protection and restoration actions that are described below.
3.9.3.1.1. Protection of ecological functions – can include the provision of information (education & outreach); watershed/community level management; tax credits; long-term leases; acquisition of development rights or conservation easements; fee simple acquisition of whole property; covenants; green builder/developer certification; environmental 'safe harbor' agreements or negotiated regulatory relief; or risk-transfers (government insurance) through negotiated management or development practices (HCP or 4d rule inclusion, etc.)
3.9.3.1.2. Physical Restoration – can include matching or in-kind grant funded restoration projects; or fully funded restoration projects

3.9.3.2. In-Voluntary Means – this category includes protection and restoration actions that might be undertaken or required by any one of the various governments that have the appropriate ownership, jurisdiction or authority.

3.9.3.2.1. Protection – can include public lands management for conservation; strict enforcement of current regulations on private lands; development of new regulations for private lands; eminent domain acquisition; or negotiated development (contracts, permits, licenses, etc.)

3.9.3.2.2. Physical Restoration – can include facility construction on public lands; or eminent domain acquisition for facility construction.

In each conservation unit, specific programmatic choices, from the list above, have been included to address issues that could not otherwise be addressed by projects. Those programmatic choices have been selected based on their political, economic and biological appropriateness and based on their fit to the scale of the issue that they are being used to address.

In addition to the programmatic issues that are addressed within each conservation unit, an overall description of the programmatic decisions taken by the Counties, as the land use authorities in Hood Canal, is listed in Chapter 13 of this SRP, for those issues that are less locally specific and more general in nature, or that address an issue on a jurisdictional basis or at the ESU-wide scale.